

# MULTILAYER ELECTRONIC COMPONENT AND METHOD OF MANUFACTURING THE SAME

## CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 10-2015-0145520 filed on Oct. 19, 2015 in the Korean Intellectual Property Office, the entire disclosure of which is incorporated herein by reference for all purposes.

## BACKGROUND

[0002] 1. Field

[0003] The following description relates to a multilayer electronic component and a method of manufacturing the same.

[0004] 2. Description of Related Art

[0005] An inductor is a representative passive electronic component that can be combined with a resistor and a capacitor to form an electronic circuit configured to remove noise. An inductor may be combined with a capacitor using electromagnetic characteristics to configure a resonance circuit, such as a filter circuit or the like, that amplifies a signal in a specific frequency band.

[0006] In a case of a multilayer inductor, inductance may be implemented by forming coil patterns on respective insulator sheets that are primarily formed of a magnetic material, using a conductive paste, or the like, and stacking the insulator sheets to form a coil in a sintered multilayer body.

[0007] One known type of inductor is a perpendicular multilayer inductor including an internal coil formed in a plane perpendicular to a substrate mounting surface in order to provide higher inductance. The perpendicular multilayer inductor may obtain a high inductance value in comparison to a multilayer inductor in which an internal coil is formed in a horizontal direction, and may increase a self resonant frequency.

[0008] A high-frequency inductor, which is a product having an open magnetic path using a dielectric material, has a problem in that equivalent series resistance may increase in a high frequency region due to a loss of magnetic flux and parasitic capacitance generated between internal metals or between internal and external metals, resulting in a Q factor of the inductor being deteriorated. In particular, equivalent series resistance (Rs) is represented as a sum of a direct current (DC) resistance which is constant regardless of a change in frequency and an alternating current (AC) resistance of which a magnitude and a value are changed depending on a change in AC frequency. The AC resistance, which is an imaginary component of impedance, is not simply consumed as heat energy unlike the DC resistance (Rdc), but since inductance accumulates energy as a magnetic field and capacitance accumulates energy as an electric field, the AC resistance is loss-free resistance. However, since a signal which should flow in the frequency is accumulated as the electric field and the magnetic field and is thereby congested, the signal may be considered to be lost, and thus the signal may be classified as a resistance component.

[0009] The AC resistance increases due to a skin effect resulting from an increase in the AC frequency and a

parasitic effect, and the equivalent series resistance (Rs) may increase. That is, as an interlayer distance between coils and a distance between the coil and external electrodes is decreased, the equivalent series resistance (Rs) may increase due to the parasitic effect and an increase in parasitic capacitance. As the frequency is increased, the equivalent series resistance (Rs) is increased due to the skin effect, thereby deteriorating the Q factor.

[0010] It is therefore desirable to improve the Q factor of a multilayer electronic component by decreasing the parasitic capacitance generated between the internal metals of the electronic component or between the internal and external metals of the electronic component to decrease the equivalent series resistance (Rs), and by decreasing the loss of the magnetic flux to increase an inductance value of the electronic component.

## SUMMARY

[0011] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0012] In one general aspect, a multilayer body includes: stacked insulating layers and internal coil parts disposed on the insulating layers; external electrodes disposed on an outer portion of the multilayer body and connected to the internal coil parts; and a material layer disposed on an outermost internal coil part among the internal coil parts and having a specific resistance that is lower than a specific resistance of the internal coil parts

[0013] The material layer may include silver (Ag).

[0014] The internal coil parts may include externally exposed first and second lead portions.

[0015] The first and second lead portions may have an L shape in a cross section of the multilayer body in a length-thickness plane.

[0016] The multilayer body may further include an externally exposed dummy lead part disposed on the insulating layers.

[0017] The internal coil parts may be disposed in planes perpendicular to a substrate mounting surface of the multilayer body.

[0018] The external electrodes may be disposed on end surfaces of the multilayer body or a bottom surface of the multilayer body.

[0019] In another general aspect, a method of manufacturing a multilayer electronic component includes: preparing insulating sheets; forming internal coil patterns on the insulating sheets; applying a material layer having a specific resistance lower than a specific resistance of the internal coil patterns onto an outermost internal coil pattern among the internal coil patterns; stacking the insulating sheets to form a multilayer body including internal coil parts formed by the internal coil patterns; and forming external electrodes connected to the internal coil parts on an outer portion of the multilayer body.

[0020] The material layer may include silver (Ag).

[0021] The internal coil parts may include externally exposed first and second lead portions.

[0022] The first and second lead portions may have an L shape in a cross section of the multilayer body in a length-thickness plane.